

Agenda Item 13.3

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**ICES Advice June 2013:  
Request from EU for Scientific advice  
on data collection issues**

**Action Requested**

- Take note

Submitted by

Secretariat



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TO BRING THEIR OWN COPIES OF DOCUMENTS TO THE MEETING**



**ECOREGION      General advice****SUBJECT              Request from EU for Scientific advice on data collection issues****Advice summary**Review of existing indicators

A summary of the qualities and the future utility of the existing Data Collection Framework (DCF) Annex XIII indicators is provided. ICES advises that data collection and assessment to support indicators 5, 6, and 7 should continue. For indicators 2, 3 and 4, ICES does not advise further implementation as there are challenges to target setting, and response times are slow and variable. Indicators 1 and 8 have little further utility as they either do not address the priority issues in the most effective way (indicator 1) or will shortly be superseded by legal or regulatory changes (indicator 8).

New indicators

In addition to development of existing DCF Annex XIII indicators 5, 6, and 7, ICES advises that new indicators are required to track and to guide the management of the effects of fisheries on the ecosystem and so aid in the implementation of the Marine Strategy Framework Directive (MSFD) through its descriptors. These indicators can be classified in the following manner:

*Removal<sup>1</sup> of protected and sensitive species (including bycatch of non-target species) (MSFD Descriptor 1)*

An indicator of fishing effects on Endangered, Threatened and Protected (hereafter “protected”) and sensitive species will be useful for the EU and its Member States to meet a number of policy and legislative targets. Information is lacking on the abundance of, and bycatch of, many protected and sensitive species. Coverage of fisheries under the DCF is biased away from those fisheries carrying the greatest risk of catching many protected and sensitive species. Development of remote electronic video recording seems likely to be a cost-effective way of assessing bycatch in the future as it can be applied to all parts of the fishing fleet (metiers and/or fleet segments) as defined in DC-MAP (Data Collection – Multi-Annual Plan).

*Foodweb effects (MSFD Descriptor 4)*

Stock assessments of all forage fish species that account for >5% of the total fish biomass, or that are important in the diet of dependent species (especially when these are protected species), are required. These assessments should take account of the distribution and availability of the forage species to dependent predators. This indicator will indicate whether sufficient prey are available for important predators in the foodweb. Among the indicators that can describe changes in foodwebs, forage fish abundance and distribution is one of the few that can respond in a defined way to a fishing activity and is relevant to Descriptor 4 of MSFD.

*Impacts on seafloor habitats and associated communities (Damage to the seafloor and its biological communities) (MSFD Descriptor 6)*

ICES recommends some changes to the existing pressure indicators addressing this issue (DCF Annex XIII indicators 5, 6, 7) to enhance their ability to assess impacts on seabed habitats. ICES advises that species indicative of seabed habitat type caught in surveys, and by commercial vessels with on-board observers, be recorded. As observers are already on some of these vessels, benthic data collection will be relatively cost-effective. This will further provide links to MSFD criteria 6.1 and 6.2 (seafloor integrity) and 1.6 (biological diversity). ICES recommends that fishing positions of all vessels, including those less than 12 m, be recorded and reported at 30-minute intervals.

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<sup>1</sup> The word “removal” refers to extra mortality caused by fishing, including direct catch, bycatch and lethal interactions caused by collision with fishing gear.

## Request

*ICES is requested to assist in the identification of new data to be collected in support of the implementation of the Common Fisheries Policy (CFP) and the Marine Strategy Framework Directive (MSFD).*

*ICES should also assist in the review of the existing environmental indicators to measure the effects of fisheries on the marine ecosystem (2010/93/EU, Appendix XIII) [question 1] and in the selection and development of new indicators to measure the impacts of fisheries on the marine ecosystem, including by-catch of non-target species, the food web and damage to the seafloor and its biological communities, for each MSFD marine region or sub-region and finally make proposals in time for the new DC-MAP 2014-2020 review [question 2].*

ICES interpretation of the request is based on the understanding that it is from DG Environment and it is to explore the overlap area between CFP and MSFD data needs – and not to describe all data needs for CFP and MSFD. Therefore, some types of data that are not currently collected under the DCF but whose inclusion in the DC-MAP would be relevant are not included in this response as they are considered to be solely related to the CFP.

## Advice<sup>2</sup>

### Review of existing indicators (question 1)

ICES assessed the capacity of the DCF (2010/93/EU) Appendix XIII indicators 1 to 8 to detect and measure the effects of fisheries on the marine ecosystem. Table 1.5.2.1.1 summarizes the future utility of each indicator.

ICES notes that the existing DCF Annex XIII indicators were intended to track fishing effects on the ecosystem, and that targets cannot be set for all of these indicators. For this reason, ICES advises that if indicators are to be progressed to support MSFD it is a condition that targets can be set to determine (a) when measures to achieve Good Environmental Status (GES) have been established and (b) whether GES has subsequently been achieved.

### New indicators (question 2)

ICES advises that two groups of indicators would be needed to measure the impacts of fisheries on the marine ecosystem:

- (1) Pressure indicators that are suitable in describing the impacts of fisheries (i.e. metier and/or fleet segment) on the marine ecosystem. It is important that data are collected and stored at the highest resolved metier and/or fleet segment in DC-MAP.
- (2) State and pressure indicators for which targets are set at the regional or sub-regional scale. The state indicators would be used to describe the state of the ecosystem in relation to targets (e.g. targets consistent with achieving GES in the MSFD). Corresponding pressure indicators would be used to define the levels of fishing pressure (e.g. as mortality rates, spatial distribution of fishing activity) that would need to be achieved to meet the targets for state. Indicators in this group would describe state in relation to targets for MSFD descriptors 1) biodiversity, 3) commercial fishes, 4) foodwebs, and 6) seafloor integrity, as these are directly affected by fishing.

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<sup>2</sup> In this advice, the use of ‘regions’ and ‘sub-regions’ is consistent with EC (2008).

**Table 1.5.2.1.1** Advice on existing environmental indicators to measure the effects of fisheries on the marine ecosystem, in relation to utility for implementing MSFD. Codes in italics indicate potential relevance to MSFD descriptors and criteria.  
 Low – recommend discontinuation within DC-MAP.  
 Medium – keep for research but indicator not recommended for management purposes.  
 High – develop indicator further; DC-MAP should be developed to ensure that these indicators are calculated and reported.

	<b>Indicator</b>	<b>Definition</b>	<b>Future utility</b>
1	Conservation status of fish species	Indicator of biodiversity to be used for synthesizing, assessing, and reporting trends in the biodiversity of vulnerable fish species.	<b>Low</b> ; this indicator does not address pressure and state on the most sensitive species.
2	Proportion of large fish ( <i>D1.3, D4.2</i> )	Indicator for the proportion of large fish by weight in the assemblage, reflecting the size structure and life history composition of the fish community.	<b>Medium</b> ; this indicator has a long response time to the effects of fishing and the responses are variable. Although targets have been proposed they are not linked to a clear consequence or benefit and may be perceived as having low policy relevance. Even if a target is set, it cannot be used to guide management of specific metiers and/or fleet segments.
3	Mean maximum length of fishes ( <i>D1.3</i> )	Indicator for the life history composition of the fish community.	<b>Medium</b> ; this indicator has a long response time to the effects of fishing and the responses are variable. Although targets have been proposed they are not linked to a clear consequence or benefit and may be perceived as having low policy relevance.
4	Size at maturation of exploited fish species ( <i>D1.3</i> )	Indicator of the potential ‘genetic effects’ on a population.	<b>Low</b> ; targets cannot be set, trends not linked to a clear consequence or benefit. Management response to achieve targets not defined.
5	Distribution of fishing activities ( <i>D6.1</i> )	Indicator of the spatial extent of fishing activity. Reported in conjunction with ‘Aggregation of fishing activities’.	<b>High</b> . Methods exist for analysis. Spatial footprints can be mapped by metier.
6	Aggregation of fishing activities ( <i>D6.1</i> )	Indicator of the extent to which fishing activity is aggregated. It would be reported in conjunction with the indicator for ‘Distribution of fishing activities’.	
7	Areas not impacted by mobile bottom gears	Indicator of the area of seabed that has not been impacted by mobile bottom fishing gears in the last year, computed for a series of bathymetric strata and potential substrate type. It responds to changes in the distribution of bottom fishing activity resulting from catch controls, effort controls, or technical measures (including MPAs established in support of conservation legislation) and to the development of any other human activities that displace fishing activity (e.g. wind farms).	
8	Discarding rates of commercially exploited species (discarding can also include unwanted bycatch that is landed)	Indicator of the rate of discarding of commercially exploited species in relation to landings.	<b>Low</b> ; ICES notes that future policy will be to avoid all discards of commercial species; there is thus no value in pursuing this indicator.

### *Removal of protected and sensitive species (including bycatch of non-target species)*

Knowledge of removal rate per unit effort, catch weight, or catch value will be required. To generate an indicator of the consequences of removal of protected and sensitive species, it is necessary to know or assess the number of animals killed in fisheries and the abundance of each species.

ICES advises that reliable schemes to establish population abundance of animals likely to be affected by fisheries removal and the number of animals being caught should be established to measure population effects on protected and sensitive species and to set targets for acceptable rates of removal.

ICES notes that it is a simple matter to generate a list of species protected under EU legislation. ICES suggests that a risk assessment should be undertaken to focus DC-MAP data collection on those species most likely to be adversely affected by fishing removal.

### *Foodweb effects*

ICES advises that developing indicators of foodwebs is complex. While many indicators can describe changes, few respond in a defined way to a manageable pressure. There is an exception to this advice; large 'forage' fish stocks which provide important prey for other fishes, marine mammals, and seabirds. For these stocks, biomass and fishing mortality should be assessed in relation to reference points. ICES advises that when stock assessments of forage fish include estimates of natural mortality that incorporate top predators, the biomass limit reference points are then robust indicators of the impact of fisheries on the provision of forage fish for the foodweb.

ICES notes that although most large populations of forage fish are currently assessed, some are not (for example sprats and sandeels to the west of the United Kingdom) as they are presently not exploited. As a guideline, where there are indications that these populations constitute more than ca.5% of the fish biomass in a region, data should be collected to allow these populations to be brought into the assessment process. A process will be required to identify these stocks. ICES advises that data be provided on the spatial structure of forage fish stocks and incorporated into stock assessments, to allow biomass limit reference points to be set that prevent local depletions of forage fish by fisheries that would impact on predators.

### *Impacts on seafloor habitats and associated communities (Damage to the seafloor and its biological communities)*

ICES advises that the existing DCF Annex XIII indicators 5, 6, and 7 be extended to all métiers/fleet segments (this includes smaller vessels that are currently not included in Vessel Monitoring System (VMS) regulations) and that more frequent (30-minute) position updates be transmitted and recorded.

ICES notes that data on the distribution of main indicator species of benthic habitats and substrate (including biogenic habitats) could be identified to use in conjunction with the pressure indicators 5, 6, and 7. ICES advises that species indicative of seabed habitat type caught in surveys, and on-board commercial vessels with on-board observers, be recorded. This can be used to identify and prioritize for management gear/habitat interactions, and provide stronger links to MSFD criteria 6.1 and 6.2 (seafloor integrity) and 1.6 (habitat condition).

### Priorities for the collection of data on the ecosystem effects of fishing in DC-MAP

If collection of data to allow calculation of all the recommended indicators cannot be resourced, then the relative priorities for the collection of data are:

1. Removal rates of protected species.
2. VMS data for all fleet segments and/or métiers.
3. Assessments of state of forage stocks.
4. Removal rates of sensitive species (defined following risk assessment).
5. Data on interactions between bottom fisheries and habitat.

### **Basis of the advice**

#### *Review of existing indicators*

The review of existing indicators to measure the impacts of fisheries on the marine ecosystem was based on:

- An analysis of existing DCF Annex XIII indicators made (see Table 1.5.2.1.2) considering whether:
  - a. the indicator has been tested or assessed,
  - b. a target can be set for the indicator,
  - c. the indicator is suitable for tracking fishing effects on the marine ecosystem,
  - d. there are challenges obtaining data used to calculate the indicator,
  - e. the indicator can be applied to all regions and sub-regions;
- A review of the impacts of fisheries on the marine ecosystem that were not addressed by existing indicators but would (a) indicate differences in the environmental impacts of fisheries and (b) indicate the extent to which fisheries management measures influenced progress towards potential or stated targets.

*Future assessment of DCF indicators*

For the existing DCF Annex XIII indicators ICES will be calculating and reporting time-series for the existing indicators this autumn (2013), recognising that four full years of data are now available for reporting. In conjunction with existing ICES analyses and reports (ICES, 2012a, 2012b) this process will provide further insight into the performance of these indicators and any constraints affecting their calculation and use. ICES will be making a data call in June 2013 to collate the data required for this analysis.

**Table 1.5.2.1.2** Review of existing DCF Annex XIII indicators. Codes in italics indicate potential relevance to MSFD descriptors and criteria.

	<b>Indicator</b>	<b>Has indicator been tested/assessed?</b>	<b>Can target be set?</b>	<b>Suitability for tracking fisheries impact?</b>	<b>Challenges to data provision</b>	<b>Generic or region specific</b>
1	Conservation status of fish species	The indicator has been assessed by ICES (2012a, 2012b), in EC project reports (e.g. Borges <i>et al.</i> , 2011) and in scientific literature (Dulvy <i>et al.</i> , 2006).	Targets have been proposed for purposes of investigating performance of the indicator but they are not explicitly linked to existing legislation.	Captures trends in status of some fish species but does not address well the most sensitive species that are potentially at highest risk from fishing mortality (ICES 2012a, 2012b).	Can be calculated from trawl survey data as collected to meet the requirements of the current DCF.	Can be applied in any region where demersal trawl surveys are conducted.
2	Proportion of large fish ( <i>D1.3</i> , <i>D4.2</i> )	The indicator has been comprehensively assessed by ICES (2012a, 2012b), EC projects Piet <i>et al.</i> (2011), Bloomfield <i>et al.</i> (2011), Borges <i>et al.</i> (2011) and in the scientific literature (e.g. Shephard <i>et al.</i> , 2011; Greenstreet <i>et al.</i> , 2011)	Targets have been proposed but they are not explicitly linked to existing legislation or linked to a clear consequence or benefit.	Captures trends in response of fish community to fishing. Principal concerns are slow and variable responses to changes in management, and technical issues with methods (ICES 2012a, 2012b).	Can be calculated from trawl survey data as collected to meet the requirements of the current DCF.	Can be applied in any region where demersal trawl surveys are conducted.
3	Mean maximum length of fishes ( <i>D1.3</i> )	The indicator has been assessed by ICES (2012a, 2012b) and in EC projects Piet <i>et al.</i> (2011), Bloomfield <i>et al.</i> (2011), and Borges <i>et al.</i> (2011).	Targets have been proposed but they are not explicitly linked to existing legislation or linked to a clear consequence or benefit.	Captures trends in response of fish community to fishing. Principal concerns are slow and variable responses to changes in management and technical issues with methods (ICES 2012a, 2012b).	Can be calculated from trawl survey data as collected to meet the requirements of the current DCF.	Can be applied in any region where demersal trawl surveys are conducted.
4	Size at maturation of exploited fish species ( <i>D1.3</i> )	The indicator has been assessed by ICES (2012b). There is scientific uncertainty over whether genetic change is induced by fishing (e.g., Hutchings and Fraser (2008), Kuparinen and Merilä (2007)).	Targets have not been proposed, indicator recommended to track trends in size at maturation.	Unknown: performance not comprehensively assessed.	Data to calculate this indicator are collected on the current DCF but for relatively few species (ICES, 2012b).	Can be applied in any region where size at maturity is estimated.
5	Distribution of fishing activities ( <i>D6.1</i> )	Further developed into two specific and operational indicators: (a) Total area fished and (b) Proportion of surface area fished. The indicator has been assessed by ICES (2012b).	At present no target value exists.	Only suitable for tracking fishing impact in relation to D6 if based on fishing métiers that actually disturb the seafloor. In that case (b) is the preferred indicator as this shows the proportion of the seafloor disturbed annually.	Confidentiality issues often prevent access to VMS data in a format to calculate the indicators at the appropriate spatial and temporal scale. Not all fisheries have VMS.	This indicator can be calculated for any area. They can even be calculated for a specific habitat (potential relevance for D1) if data exist.

	<b>Indicator</b>	<b>Has indicator been tested/assessed?</b>	<b>Can target be set?</b>	<b>Suitability for tracking fisheries impact?</b>	<b>Challenges to data provision</b>	<b>Generic or region specific</b>
6	Aggregation of fishing activities ( <i>D6.1</i> )	Further developed into two specific and operational indicators, i.e. (a) Proportion of surface area fished by specific proportion of effort, and (b) Proportion of surface area fished at specific intensity. Indicator has been assessed by ICES (2012b).	At present no target value exists.	Only suitable for tracking fishing impact in relation to D6 if based on fishing metiers that actually disturb the seafloor. In that case (b) is the preferred indicator, showing the proportion of the seafloor fished more than once a year.	Confidentiality issues often prevent access to VMS data in a format to calculate the indicators at the appropriate spatial and temporal scale. Not all fisheries have VMS.	This indicator can be calculated for any area. It can even be calculated for a specific habitat (potential relevance for D1) if data exist.
7	Areas not impacted by mobile bottom gears	Further developed into two specific and operational indicators, i.e. (a) Cumulative proportion of surface area not impacted over a specific time period, and (b) Proportion of surface area not impacted at specific level of confidence. Indicator has been assessed by ICES (2012b).	At present no target value exists.	This indicator was intended to show the impact on the seafloor and is therefore the most suitable. In this case (a) is the preferred indicator showing, the proportion of the seafloor not impacted over a period long enough to assume it is recovered even if disturbed prior to this period. As such this proportion is by definition in Good Environmental Status (GES) if not impacted by other human activities.	Confidentiality issues often prevent access to VMS data in a format to calculate the indicators at the appropriate spatial and temporal scale. Not all fisheries have VMS. The absence of VMS coverage for vessels under 12 m is of particular importance in inshore and coastal areas. For potential relevance to D1 benthic bycatch and substrate should be reported.	This indicator can be calculated for any specific area. It can even be calculated for a specific habitat (potential relevance for D1) if data exist.
8	Discarding rates of commercially exploited species (discarding can also include unwanted bycatch that is landed)	Not tested systematically though discard rates are used in some parts of ICES advice.	At present no target value exists	This tracks additional mortality on commercial fish stocks, and is necessary to understand total pressure on a stock	No major challenges to data provision but relies on unbiased sampling of fisheries.	This indicator can be calculated for any specific area.

## New indicators

ICES advises that three new classes of indicators should be supported by DC-MAP. These are: ‘removal of protected and sensitive species’, ‘foodweb effects’, and ‘impact on seafloor habitats and associated communities’. Table 1.5.2.1.3 summarizes the new proposals for indicators. These new indicators are general rather than technical specifications of the indicator. ICES recommends that when/if indicators are carried forward, detailed specifications must be prepared and analytical methods supported by common analytical tools.

Table 1.5.2.1.3 Proposed indicators to address the three issues identified in the advice, the relevance of these indicators to the MSFD and their use (comparing state and pressure in relation to reference points).

Issue	MSFD relevance	Indicator(s)	Frequency	Usage
<b>Removal rates of protected and sensitive species</b>	D1(D4)			
		Removal rates of protected species in relation to population size by region and sub-region.	Calculated annually.	Comparison of removal rates of protected species with reference points.
		Removal rates of sensitive species in relation to population size by region and sub-region.	Calculated annually.	Comparison of removal rates of sensitive species with reference points.
<b>Foodweb effects</b>	D4.3	Fishing mortality rate on forage fish stocks expressed in relation to reference points.	Calculated annually.	Comparison of mortality on forage fish stocks with reference points.
		Spawning-stock biomass of forage fish stocks expressed in relation to reference points.	Calculated annually.	Comparison of status of forage fish stocks with reference points.
		Spatial distribution of forage fish stocks expressed in relation to reference points.	Calculated annually.	Comparison of distribution of forage fish stocks with reference points.
<b>Impacts on seafloor habitats and associated communities</b>	D6.1	Distribution of fishing activities (based on DCF Annex XIII indicator 5) by fleet segment/metiers, expressed in relation to fisheries effort, catch rate, and catch value.	Calculated annually.	Comparison of relative effects of different fleet segments/metiers on seabed habitats. No reference point.
		Aggregation of fishing activities (based on DCF Annex XIII indicator 6) by fleet segment/metiers, expressed in relation to fisheries effort, catch rate, and catch value.	Calculated annually.	Comparison of relative effects of different fleet segments/metiers on seabed habitats. No reference point.
		Areas not impacted by mobile bottom gears (based on DCF Annex XIII indicator 7) by fleet segment/metiers at small scales and for combined fleets at regional and sub-regional gears.	Calculated annually.	Assessment of extent of areas unimpacted by towed bottom gears. No reference point.

### *Use of DC-MAP data and indicators to support MSFD*

The MSFD provides a clear context for indicator development because the CFP is required to be used as the primary instrument to manage the impacts of fisheries on the marine ecosystem to the extent necessary to achieve GES.

For the DC-MAP, ICES considers that the priority in relation to this request is to provide the data needed to report indicators for impacts of fisheries on the marine ecosystem that pose the greatest risk and are most likely to be unsustainable.

ICES assumes that DC-MAP will be implemented through the EU Member States at a sub-regional, fishery, or fleet level, whereas the MSFD targets are the responsibility of the EU Member States alone. Whilst the EU Member States are encouraged to work together to define MSFD sub-regional targets, the setting of targets could be done in isolation from other regional EU Member States. This contrasts with the expected approach in DC-MAP. ICES notes that indicators to measure the impacts of fisheries on the marine ecosystem that are based on data collected in DC-MAP are most valuable if there is sufficient consistency in the implementation of MSFD among EU Member States, ensuring that all EU Member States in a given region or sub-region can use DC-MAP data and associated indicators. Alternatively, DC-MAP indicators would need to be developed to take account of the intentions of EU Member States in a given region or sub-region. ICES notes that surveys supported by DC-MAP also provide EU Member States with the opportunity to use the surveys as platforms of opportunity, collecting data that describe the impacts of fishing on marine ecosystems that may be relevant nationally.

### *Removal of protected and sensitive species (including bycatch of non-target species)*

Many species are caught that are not targeted. The indicators for fish will include some non-target species, but the main species of fish that may be adversely affected by bycatch are large species with low reproductive rates such as sharks and rays. Species that are included in the formal ICES fish stock assessment process need not be included in this group of indicators, but all others should be. Other non-target species that are affected include mammals, seabirds, and turtles. The bycatch of mammals and turtles should be monitored under the EU Habitats Directive (92/43/EEC); bycatch of cetaceans is also covered by Council (EC) Regulation No. 812/2004. In 2012 the Commission adopted an Action Plan to reduce incidental catches of seabirds in fishing gears; this plan includes requirements for data collection. An equivalent Action Plan for sharks was adopted in 2009.

At present, the bycatch of some species is reported by observers, working under DCF, on-board vessels. The forthcoming 'discards ban' may affect future monitoring and data collection. It could, for example, result in much greater emphasis on port-based sampling schemes, rather than sea-going observer schemes. It seems likely that bycatch of protected species will continue to be returned to the sea as they are "non-commercial" and unlicensed possession of some of these species (especially cetaceans) is illegal in most EU Member States.

The proposed indicator is the removal rate of all species protected by legislation and of all sensitive species. Removal rates would be reported as numbers and sizes of individuals caught and expressed in relation to fishing effort and/or catch weight and/or catch value in the metier and/or fleet segment. To identify the species that will be monitored in all regions and sub-regions a list of these species should be compiled for each region and sub-region. ICES recommends the application of a risk assessment process (e.g. as reviewed by ICES, 2012b) that considers the sensitivity of the species (to removal) in the first instance, followed by an assessment, if possible, of its exposure to fishing. The process should consider all fishing operations in all regions, stratified by the most highly resolved level of fleet classification used to collect data for fisheries management in DC-MAP.

In conjunction with information on the population size of protected and sensitive species, the removal rates could be used to assess impacts on the populations in relation to reference points. Limit removal rates for some species have been agreed in some political settings (e.g. for harbour porpoise by the regional conservation agreement for small cetaceans, ASCOBANS), and could potentially be set, for other populations, and the values of indicators in relation to targets can be used to report on progress towards meeting existing commitments and adopt appropriate measures to achieve GES for MSFD Descriptor Criterion 1.3.

Collection of reliable information on removal rates of sensitive and protected species is most commonly undertaken by on-board human observers. Sampling under the current Data Collection Framework (DCF) tends to focus on the metiers that discard the most fish; these are not necessarily the same metiers that have the largest catch of species of interest. Thus, bottom trawling is generally well sampled, while in some specific fishing areas set nets, longlines, and purse-seines are undersampled. Some EU Member States have undertaken additional observation schemes to meet the requirements of Council Regulation No. 812/2004 and those of the Habitats Directive (92/43/EEC). It would be possible to better define requirements on EU Member States under the DCF, but much will depend on how other data collection requirements will change under the revised Common Fisheries Policy (CFP).

Alternatives to monitoring by human observers on-board vessels could include remote electronic video recording and monitoring from vessels visiting a fishing fleet. Of these alternatives remote electronic video recording seems to have the greatest potential to meet many of the needs of the existing DCF and also to improve monitoring of bycatch of non-commercial species, and has the advantage of being useable on metiers and/or fleet segments where the carriage of a human observer poses logistical problems.

### *Foodweb effects*

ICES considers that when stock assessments of forage fish include estimates of natural mortality that incorporate top predators, the biomass limit reference points from the MSY approach are then robust indicators of the impact of fisheries on the provision of forage fish for the foodweb. When a stock assessment does not incorporate realistic estimates of predator-induced mortality, then MSY limit reference points may not be appropriate, and some alternative mechanism for ensuring forage fish biomass for predators may need to be found. Some large populations of forage fish are not assessed, primarily because they are not exploited to any great extent. In this situation, assessments of the populations should be carried out if the populations are thought to be of a significant size (>5% of the total fish biomass) based on catches, bird food needs, acoustic surveys, ichthyoplankton surveys, and other analytical methods. The choice of 5% is arbitrary and offered as provisional guidance.

VMS data are currently collected for assessing compliance with the CFP as detailed in the ‘Control Regulation’ (EC, 2009). In this advice, modifications to VMS collection procedures and greater VMS data exchange are proposed to improve the existing DCF Annex XIII indicators and to support interpretation of new state indicators. ICES recognises that changes in the collection of VMS data may not be affected through DC-MAP, but considers that indicators based on VMS data will be necessary to assess the effects of fishing on marine ecosystems in support of the MSFD and other legislation.

Calculation of the VMS indicators will require that VMS data for all metiers and/or fleet segments included in DC-MAP are available from EU Member States. To facilitate exchange and allow calculation of the indicators for all metiers, ICES recommends that data are shared by EU Member States, using gridded data that record the number of VMS fishing records by month and metier and/or fleet segment. ICES recognises that grids can introduce some small biases when indicators are calculated with VMS data allocated to fixed grids (e.g. Piet and Hintzen, 2010; Gerritsen *et al.*, 2013), but the exchange of data will rely on providing individual vessels with sufficient anonymity to support full international exchange of all VMS data. ICES recommends the sharing of gridded point data at 0.05 resolution, as already trialled in EC projects (Bloomfield *et al.*, 2011). Metiers and/or fleet segments to which position records are allocated should be determined by the fisheries management requirements of the DC-MAP. ICES recommends that the fishing positions of all vessels are recorded and reported at 30-minute intervals.

The indicators are calculated for all metiers and/or fleet segments fishing with towed bottom gears, but VMS coverage will be required for all other vessels to track their interactions with the environment. ICES recommends that this should include all fishing vessels in all waters in regions and sub-regions, including smaller and inshore vessels not currently monitored with VMS.

Recording benthic bycatch and substrate (including biogenic habitats) will enhance the interpretation of these indicators. They can then be used to identify and prioritize for management gear/habitat interactions and extend the value of these pressure indicators to provide direct links to MSFD criteria 6.1 and 6.2 (seafloor integrity) and 1.6 (habitat condition) (ICES, 2012a).

## Sources

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